



Current challenges in research for outgrower rubber plantations in Ghana

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**International conference
On “lessons learnt from support programs to smallholder rubber plantations”
November 30, 2010 – Accra - Ghana**

Challenges facing outgrowers

- Economic sustainability
- Social sustainability
- Ecological sustainability

Relevant questions of research for rubber outgrowers

Which innovative techniques will improve productivity of labor and of land ?

Under what conditions will outgrowers adopt new techniques ?

The Cirad approach

1/ Learning from the outgrowers

Describe and analyze the characteristics of farms and their technical and economic performances.

-Zoning of agricultural situations

-Typology of farms

Establish the diversity of farms to determine what support to provide.

(survey in Ghana in 2003-2004)

The Cirad approach

2/ Implementation of on-farm trials

Test of techniques or types of production organization with farmers under different socio economic conditions

It is a matter of:

- analyzing with farmers their technical, economical and social impact on farm functioning,
- studying what farmers think of these new techniques,
- determining how acceptable these techniques are taken on board by farmers.

Cirad approach

3/ Analysis of the diffusion of the innovation

Monitoring adoption and what becomes techniques

A network of reference farms is created, as the same time as the on-farm and on station trials are set up.

Relevant project of applied research for rubber outgrowers in Ghana

Scientific and technical assistance to ROPP provided since 2001, for an experimental network on farm and on research station, on the following topics:

- Planting techniques
- Clones
- Fertilization
- Intercropping
- Maintenance
- Tapping systems

Description of the trials of the applied research program and main results

1. Planting techniques:

- The purpose, for the trials, was to compare different planting materials, 8 to 10 months old stumps in polybags with standard 20-month old bare stumps.
- **Results:** no significant difference between the treatments.

- **New trials will be conducted for testing techniques and substrates:**

Coconut husk, carbonated rice husk, cocoa pod husk, empty fruit bunches



Description of the trials of the applied research program and main results

2 . Clonal trials:

Aim: to identify the agronomic characteristics of different clones compared to GT 1 as control, under different ecological conditions in Ghana

4 trials ongoing:

- 2 on farm in 2002: GT1, IRCA 18, PB 217, RRIC 100
- 1 on station in 2007: GT1, IRCA 41, IRCA 148, IRCA 314, PB 217
- 1 on Kade station, planted in July 2010: 15 clones

A new trial in Aiyinase CRI station, in 2011: 12 clones

Description of the trials of the applied research program and main results

2 . Clonal trials: 2002, results of production (D/3)

Clone	No of trees	Production per tree (kg dry rubber) 1 st year of tapping, 3 stim/year	Production per tree (kg dry rubber) 2 nd year of tapping , 6 stim/year
GT 1	45	2.1	5.4
PB 217	111	2.8	5.6
IRCA 18	133	1.6	5.8

Description of the trials of the applied research program and main results

2 . Clonal trial 2007, girth measurement at 1 m, 2 and 3 years:

CLONE	Mean girth (cm) 2009	Expected Mean girth (cm) 2009	Mean Girth (cm) 2010	Expected Mean Girth 2010
GT 1	10	14	18.0	20-25 cm
IRCA 41	13	14	20.8	20-25 cm
IRCA 148	16	14	20.0	20-25 cm
IRCA 314	14	14	18.7	20-25 cm
PB 217	10	14	17.5	20-25 cm

Description of the trials of the applied research program and main results

3. Fertilisation and mulching: starting in 2010, on farm and on station

Aim: to study the effect of mulching and additional fertilizer application on young immature trees during dry season to improve soil moisture and growth of rubber.

FO3: 3 ha, 3 clones, 3 replications, 4 treatments (planting 2008)

Treatment	2010	2011	2012 to opening
1) Control	No Fertilisation	No Fertilisation	No Fertilisation
2) 8 kg Mulch coconut husk + Standard ROPP NPK	400 g 15-15-15 + Mulch	400 g 15-15-15 + Mulch	400 g 15-15-15 + Mulch
3) N + P + K + Mg until opening	120 g urea* + 50 g KCl + 50 g Kieserite + 300 g Rock P	120 g urea* + 50 g KCl + 50 g Kieserite	120 g urea* + 50 g KCl + 50 g Kieserite
4) 8 kg Mulch coconut husk +N + P + K + Mg until opening	Mulch +120 g urea* + 50 g KCl + 50 g Kieserite + 300 g Rock P	Mulch +120 g urea* + 50 g KCl + 50 g Kieserite	Mulch +120 g urea* + 50 g KCl + 50 g Kieserite

* split application in August and November

Fertilization Trial - FO3



Coconut husk mulch on a one-year planting (+ 42% of girth)



Proliferation of roots in the upper soil surface



Description of the trials of the applied research program and main results

4. Intercropping systems: rubber-coconut and rubber-citrus

Aim: to provide technical information to farmers with limited land resources, or farmers wishing to diversify their farming system for income security.

Results: planting 2003

Treatment	Rubber girth at 5.5 years, in cm	Rubber girth at 7 years, in cm	% of trees > 50 cm
Rubber monocrop	39	47	30
Rubber -coconut	40.5	50	37
Rubber monocrop	36.5	47.7	
Rubber -citrus	36	45.3	30

Intercropping systems



rubber/coconut



rubber/citrus

Description of the trials of the applied research program and main results

5. Maintenance

Aim: To evaluate performance of weed management within row (manual or herbicide) on growth of young rubber.

MO1A: trial starting in Jan 2011, on a 5 clones trial planted in 2007, on station, 3 treatments, 3 replications

Treatments	Within Row	Interrow
T1: Manual 4x	Manual 4x/year	manual
T2: Herbicide 3x (100 ml/15 l) Glyphosate 360 g/l	Manual year 0 to 3 Herbicide year 4 and beyond, 3 times/year	manual
T3: Herbicide 4x (75ml/15 l) Glyphosate 360 g/l	Manual year 0 to 3 Herbicide year 4 and beyond , 4 times/year	manual

Maintenance



Description of the trials of the applied research program and main results

6. Tapping systems

Aim : To compare frequency of tapping and frequency of stimulation, depending on clonal metabolism and age of the trees, for best productivity of the labour and of the trees.

Ethephon is the stimulant used to compensate reduction in tapping frequency to achieve same yield.

E.g. : standard tapping frequency d/3 will be compared with reduced tapping frequency d/4 and increased stimulation.

Response to stimulation is dependent on clone, e.g. PB 217 can be stimulated more than GT 1.

Description of the trials of the applied research program and main results

6. Tapping systems: 12 new trials in 2011

1. Tapping Frequency: 2 treatments

- 1) Control : d/3 6d/7: 104 tappings/year with **3** stimulations/year
 - 2) Reduced frequency : d/4 d/6: 78 tappings/year with **6** Stimulations/year
- Clon: GT 1 at the opening

2. Frequency of stimulation: 3 treatments, 3 replications (3 farms)

Treatments	GT 1	PB 217
1- Control ET 2.5% Pa 0.75g/1cm D/3	3/y	3/y
2- ET 2.5% Pa 0.75g/1cm D/3	4/y	6/y
3- ET 2.5% Pa 0.75g/1cm D/3	6/y	9/y

Description of the trials of the applied research program and main results

6. Tapping systems: 12 new trials in 2011

3. Frequency of stimulation due to AGE on PB 217:

3 treatments, 3 replications (3 farms), opening trees and D/3

Treatments	1 st year	2 nd year	3 rd year
1- Control ET 2.5% Pa 0.75g/1cm D/3	3/y	3/y	3/y
2- ET 2.5% Pa 0.75g/1cm D/3	3/y	6/y	9/y
3- ET 2.5% Pa 0.75g/1cm D/3	6/y	9/y	12/y

Tapping Trials

Application of stimulant



Emerging issues or new topics for research

- **Foliar Diseases:**

Corynespora incidence on new clones (e.g. high susceptibility of IRCA 18): methods of control, clonal resistance, epidemiology, diversity of the pathogen.

- **Fertilization** on tapped trees to improve yield and productivity

- **Cover crops** to improve soil fertility and moisture, growth of rubber trees, and to reduce the cost of maintenance.

- **Intercropping:** rubber with perennial, annual and transitory crops.

- **Tapping systems:** new system of tapping for new clones, etc...

- agronomic techniques to **reduce unproductive period**

- how **increase productivity?** Multi factors analyze

- **GIS database** for rubber farms in Ghana: useful for clonal distribution, diseases incidence, soils, land productivity, socio-economic studies,...

CONCLUSIONS

Research is an important component in a rubber development project, as planters seek new techniques of increasing their productivity.

Applied research provides relevant results for the benefit of farmers.

Farmers communicate their problems to scientists for applied research to address these challenges.

Rubber research in Ghana should be encouraged to cover the whole country, because of differences in environmental and socio-economic factors in the growing areas.

Thank you for your attention

